SOCIETIES AND ACADEMIES

LONDON

Royal Society, May 2.—"On the Reversal of the Lines of Metallic Vapours," by G. D. Liveing, M.A., Professor of Chemistry, and J. Dewar, M.A., Jacksonian Professor University of Cambridge. No. II.

Since their last communication to the Society the authors have succeeded in reversing characteristic lines of the vapours of rubidium and cæsium. They operated in glass tubes into which some dry rubidium or cæsium chloride was introduced, and a fragment of fresh cut sodium, and afterwards either dry hydrogen or dry nitrogen admitted, and the end of the tube sealed off at nearly the atmospheric pressure. Through these tubes placed lengthways in front of a spectroscope a lime-light was viewed. On warming the bulb of a tube in which rubidium chloride had been sealed up with sodium, very soon there appeared two dark lines near the extremity of the violet light identical in position with the well-known violet lines of rubidium. Next appeared faintly the channelled spectrum of sodium in the green, and then a dark line in the blue, very sharp and decided, in the place of the more refrangible of the characteristic lines of cæsium in the flame spectrum. As the temperature rose these dark lines, especially those in the violet, became sensibly broader; and then another fine dark line appeared in the blue in the place of the less refrangible of the cæsium blue lines. During this time no dark line could be observed in the red, but as the temperature rose a broad absorption band appeared in the red with its centre about midway between B and C, ill-defined at the edges, and though plainly visible not very dark. The lines in the violet had now become so broad as to touch each other and form one dark band. On cooling the absorption band in the red became gradually lighter without becoming defined, and was finally overpowered by the channelled spectrum of sodium in that region. The double dark line in the violet became sharply defined again as the temperature fell. There are two blue lines in the spectrum of rubidium taken with an induction-coil very near the two blue lines of cæsium, but they are comparatively feeble, and the two dark lines in the blue which the authors observed in the places of the characteristic blue lines of cæsium they believe must have been due to a small quantity of cæsium chloride in the sample of rubidium chloride.

When a tube containing cæsium chloride and sodium was observed, in the same way as the former, the two dark lines in the blue were seen very soon after the heating began, and the more refrangible of them broadened out very sensibly as the temperature increased. The usual channelled spectrum of sodium was seen in the green, and an additional channelling appeared in the yellow, which may be due to cæsium or to the mixture of the two metals. They have at present no metallic cæsium wherewith to decide this question. Indeed the cæsium chloride used was not free from rubidium, and the dark lines of rubidium were distinctly seen in the violet.

It is remarkable that these absorption lines of cæsium coincide with the blue lines of cæsium as seen in the flame, or in the spark of an induction-coil without a jar, not with the green line which that metal shows when heated in an electric spark of high density. In like manner both the violet lines of rubidium are reversed in the tubes, and both these violet lines are seen when the spark of an induction-coil, without jar, is passed between beads of rubidium chloride fused on platinum wire, though only one of them appears when a Leyden jar is used.

The authors have extended their observations on the absorption of magnesium and of mixtures of magnesium with potassium and sodium, using iron tubes placed vertically in a small furnace fed with Welsh coal, as described in their former communication.

The result of several observations, when commercial magnesium (*i.e.*, magnesium with only a small percentage of sodium in it) was used, is that the absorption produced by magnesium consists of—

1. Two sharp lines in the green, of which one, which is broader than the other, and appears to broaden as the temperature increases, coincides in position with the least refrangible of the *b* group, while the other is less refrangible and has a wave-length very nearly 5,213. These lines are the first and the last to be seen and very constant, and they at first took them for the extreme lines of the *b* group.

2. A dark line in the blue, always more or less broad, difficult to measure exactly, but very near the place of the brightest blue line of magnesium. This line was not always visible, indeed rarely when magnesium alone was placed in the tube. It was better seen when a small quantity of potassium was added. The measure of the less refrangible edge of this band then gave a wave length of very nearly 4,615.

3. A third line or band in the green, rather more refrangible than the *b* group. This is best seen when potassium as well as magnesium is introduced into the tube, but it may also be seen with sodium and magnesium. The less refrangible edge of this band is sharply defined, and has a wave-length about 5,140, and it fades away towards the blue.

These absorptions are all seen both when potassium and when sodium are used along with magnesium, and may be fairly ascribed to magnesium, or to magnesium together with hydrogen.

But besides these other absorptions are seen which appear to be due to mixed vapours.

4. When sodium and magnesium are used together, a dark line, with ill-defined edges, is seen in the green, with a wave-length about 5,300. This is the characteristic absorption of the mixed vapours of sodium and magnesium, it is not seen with either vapour separately, nor is it seen when potassium is used instead of sodium.

5. When potassium and magnesium are used together, a pair of dark lines are seen in the red. The less refrangible of these sometimes broadens into a band with ill-defined edges, and has a mean wave length of about 6,580. The other is always a fine sharp line, with a wave-length of about 6,475. These lines are as regularly seen with the mixture of potassium and magnesium as the above-mentioned line (5,300) is seen with the mixture of sodium and magnesium, but are not seen except with that mixture.

6. On one occasion, with a mixture of potassium and magnesium, another dark line was seen in the blue, with a wave-length nearly 4,820. This line is very near one of the bright lines, seen when sparks from an induction-coil, without a Leyden jar, are taken between electrodes of magnesium, and may very likely be due to magnesium alone, and not to the mixture of vapours, as we only observed it on one occasion.

There is a certain resemblance between the absorptions above ascribed to magnesium and the emission spectrum seen when the sparks of a small induction-coil, without Leyden jar, are taken between electrodes of magnesium. This emission spectrum is the same, with the addition of some blue lines, as that seen when the sparks are taken from a solution of magnesium chloride, as accurately described by Lecocq de Boisbaudran, and as that seen in burning magnesium (Dr. Watts, *Phil. Mag.*, 1875).

The pair of lines (1) correspond nearly with the *b* group, but slightly displaced towards the red; the shaded band (3) corresponds less closely to the series of seven lines 5,000 to 4,930, which progressively decrease in brightness towards the blue, and is also a little less refrangible than that series; the broad line in the blue (2) corresponds to the pair of lines 4,570 and 4,590, and the remaining line (6) to the line 4,797; also both displaced a little towards the red. No absorption corresponding to the extreme lines 4,481 and 5,528 was observed. There is plainly no exact reversal except of the line b_1, and even in that case it may be an accident if we suppose the two dark lines (1) to represent the extreme lines of the group *b*. It may be noted in connection with this that the absorption lines described by the authors in their former communication as seen with sodium and potassium (wave-lengths 5,510 and 5,730) are near to, but *more* refrangible than, well-known emission lines of those elements.

They observe that there is in the solar spectrum an absorption line, hitherto unaccounted for, closely corresponding to each of the above-described absorption lines. Thus, on Angström and Thalèn's map there are dark lines at 6,580 and 6,585, with more or less continuous absorption between them, a broad dark line between 6,474 and 6,475, and a dark line at 5,300. There are also dark lines nearly, if not exactly, coincident with the series of seven bright lines of magnesium above described, which they have not seen strictly reversed. The coincidences of the series of the solar spectrum hitherto observed have, for the most part, been with lines given by dense electric sparks; while it is not improbable that the conditions of temperature, and the admixtures of vapours in the upper part of the solar atmosphere, may resemble much more nearly those in their tubes.

They intend to pursue their observations, using higher temperatures, if they can obtain tubes which will stand under those circumstances.

May 2.—"On the Determination of the Scale Value of a Thomson's Quadrant Electrometer used for Registering the Variations in Atmospheric Electricity at the Kew Observatory," by G. M. Whipple, B.Sc., Superintendent of the Kew Observatory.

The Meteorological Council, being desirous of discussing the photographic traces produced by their electrograph at the Kew Observatory some time since, requested the Kew Committee to institute a series of experiments, with the view of determining the scale value of the instrument, in order to prepare a suitable scale for measuring the curves.

The author having found, in some preliminary experiments with 300 Bunsen's elements, that the greatest potential to be obtained with these was inadequate for his purpose, he was enabled through the kindness of Dr. De la Rue, to make use of that gentleman's large chloride of silver battery for determining the scale value of the electrometer. There were in all nine experiments made, in five of which the deflections were read off with the eye, whilst in the remaining four they were registered by photography. Deflections were measured for potentials varying from 0 to 900 cells positive, and from 0 to 300 negative.

By combining the results of these experiments and taking the means for every hundred cells, the following table is obtained :—

POSITIVE.				NEGATIVE.	
No. of Cells.	Deflection in Inches.	No. of Cells.	Deflection in Inches.	No. of Cells.	Deflection in Inches.
100	0·93	600	3·95	100	1·04
200	1·77	700	4·20	200	2·34
300	2·48	800	4·42	300	3·75
400	3·09	900	4·69		
500	3·57				

On laying down these values in a curve, making use only of those between the limits of − 200 and + 700, as the others are beyond the capability of correct registration by the electrograph, a regular smooth curve is produced, which, being projected upon one of the ordinates, gives a scale by means of which the electrograms are now easily tabulated.

The value of the electromotive force of one De la Rue chloride of silver cell being 1·03 volt, as determined by Messrs. De la Rue and Müller (*Proc.* Roy. Soc., vol. xxvi. p. 324), the scale thus formed has been assumed to represent volts with sufficient accuracy for the required purpose.

Chemical Society, May 2.—Dr. Gladstone, F.R.S., president, in the chair.—A lecture on the chemical aspects of vegetable physiology was delivered by Sidney H. Vines. The lecturer commenced by giving a historical sketch of our knowledge of the absorption of carbonic acid and the evolution of oxygen by plants, the circulation of starch grains, and the functions and nature of chlorophyll. Sachs first proved that starch grains were not formed in plants which are bleached, from the absence of light, and that their formation in the chlorophyll corpuscles depended on the exposure of the plant to bright sunlight. Godlewski showed that if no carbonic acid was present no starch grains were formed. So there are two sets of phenomena, viz., the evolution of oxygen (with absorption of carbonic acid) and the formation of starch grains, for both of which three conditions are essential, viz., sunlight, chlorophyll, and carbonic acid. These two sets of phenomena are therefore probably connected and belong to the same function. Great diversity of opinion exists both as to the composition and functions of chlorophyll. The lecturer gave a short account of the views brought forward by Pringsheim, Karl Kraus, Pfaundler, Wiesner, &c., and entered more in detail into the statements and theories advanced by Sachse. In the second part the lecturer considered the formation of vegetable acids, and pointed out that the views of Liebig and Mulder had not been confirmed by subsequent experiments. The part played by pyrocatechin, asparagin, &c., in the formation of carbohydrates was next considered, and the lecturer concluded by pointing out the necessity for quantitative work before we could hope to attain clearer and more certain views on the important functions of assimilation, excretion, &c., in the vegetable kingdom.

Anthropological Institute, April 9.—John Evans, F.R.S., president, in the chair.—The following new Members were announced :—Messrs. G. J. Romanes and R. J. Hutton.—Mr. W. M. Flinders Petrie read a paper on inductive metrology, the purpose of which, as explained by him, is to deduce the units of measure employed by ancient peoples from the dimensions of existing remains. Where units derived from several different buildings coincide, a high probability of the accuracy of the result in units is obtained. This principle has been tested by application to the monuments existing among the peoples of the Mediterranean. Mr. Petrie had also applied it to the earthworks of this country. At Hill Devereux he had obtained an unit of 691 inches. At Steeple Langford, an unit had been derived which varied only by 5 inches. Near Orcheston is an earthwork forming a perfect ellipse. From this Mr. Petrie argued a considerable knowledge of mensuration on the part of the flint-workers, by whom it had been constructed. He urged the necessity of accurate measurement on the part of observers.—Dr. E. B. Tylor read a paper on the game of Patolli, in ancient Mexico, and its probable Asiatic origin. The game is a combination of dice and draughts. It was similar to a game called Patcheesi, in use in India, played by throwing cowries on to a board divided into squares of a certain pattern. So devoted are the natives to this game, that a story is told of a Provincial Governor who habitually won back his servants' wages from them at it, and thus got served for nothing.

Linnæan Society, May 2.—Dr. W. B. Carpenter, F.R.S., vice-president, in the chair.—M. C. Chambre and Mr. T. Comber were elected Fellows of the Society, and five Foreign Members, to fill the annual vacancies, were likewise unanimously elected.—Mr. J. R. Jackson exhibited specimens of fruits, leaves, and portions of the stem (used as a substitute for soap) illustrating peculiarities of *Yucca baccata*, Torrey. This plant extends from South Colorado far into Mexico. Northwards it is acaulescent, southwards it develops a trunk ten feet high. The fruit, a dark purple berry, is preserved and eaten as winter provision, and the plant is commonly known as the Rocky Mountain Banana.—A note was read from the Rev. H. H. Higgins concerning a large new Tubularian Hydrozoon (probably allied to Clava?) from New Zealand.—On behalf of Mr. Thomas Higgin there was exhibited a photograph of *Chitina ericopsis*, Carter, and also microscopic specimens of this rare species of the Hydractiniidæ from New Zealand.—Mr. J. C. Galton called attention to a spined dermal plate of the Ray tribe of fishes, mistaken for a fossil, and obtained near the Barking Priory.—The Secretary read in abstract a paper on Marupa, a genus of the Simarubaceæ, by Mr. J. Miers. This is founded on a curious fruit and specimens of wood exhibited in the Brazilian department of the Paris Exhibition, 1857. Signor Netto, in 1856, described a Brazilian plant under the designation *Odina francoana*, and bearing the vernacular name "Pão Pombo," as did the above-mentioned woods. Mr. Miers, however, is of opinion that Netto's species cannot belong to Odina as that genus is Anacardiaceous, and quite foreign to the American Continent. Then follows the technical characters of the new species *Marupa francoana* and *M. paraensis*.—A short paper was read by Mr. R. Irwin Lynch on the seed-structure and germination of a species of Pachira. The seeds were received at Kew, July, 1877, and labelled the "Provision Tree." Varying in size, they consist chiefly of one fleshy-lobed cotyledon, the second being exceedingly diminutive and functionless. Germination occurs in a fortnight after sowing, and in one instance the larger persistent cotyledon did not appear to be exhausted for nearly six months.—The main facts of a detailed communication on the occurrence of conidial fructification in the Mucorini, illustrated by Choanephora," by Dr. D. D. Cunningham, was, in his absence, read by the Secretary. According to observations and experimental investigations conducted for a series of years in India, Dr. Cunningham proved that Choanephora is a genus of Mucorine, and not Mucedine fungi, as Currey had regarded it in 1872. It is, moreover, capable of producing four kinds of fructification, as follows :—By (1.) Zygospores = sexual fructification ; by (2.) Conidia ; (3.) Sporangial spores ; and (4.) Chlamydophorous = asexual fructification. These phenomena afford a possible explanation of certain otherwise conflicting conclusions which have been arrived at by such competent observers and authorities as Brefeld, Van Tieghem, and Le Monnier. At all events, it yields a note of warning that classification of fungal organisms based alone on one form of fructification may lead to false conclusions. The present researches likewise show that M. de Bary's suggested analogy between the Mucorini and Ascomycetes, in respect of their fructification, is well founded, although the observations which originally suggested it have since been shown to be fallacious. Dr. Cunningham states that the presence of Choanephora on plants certainly greatly accelerates decay, but it is a cause, not a consequence, of advanced putrefaction.

Physical Society, March 30.—Prof. W. G. Adams, president, in the chair.—The following candidates were elected Members of the Society:—S. Bidwell, M.A., LL.B., W. Grant, E. Gurney, and J. H. Smith.—Mr. W. H. Preece described Byrne's pneumatic battery and exhibited some of the results that may be obtained by its means. It is especially devised with a view to provide the medical profession with a portable battery capable of producing a considerable amount of heat, as is required for cauterising operations. The negative plate consists of a very thin plate of platinum to which a lead backing is soldered, and this is covered with a sheet of thick copper also coated with lead, the whole being then covered with a non-conducting varnish with the exception of the exposed platinum face; such an arrangement is found to be advantageous in that it increases the conductivity of the negative plate. Two of these plates are arranged to face the zinc plate as in Wollaston's form of cell, and the exciting liquid consists of twelve ounces of bichromate of potash, one pint of sulphuric acid, and five pints of water. By using such a mixture the sulphuric acid attacks the zinc and the three atoms of very loosely combined oxygen exercise a depolarising effect by absorbing the evolved hydrogen. A fine tube dips into the exciting liquid and is so arranged that it conducts a current of air, from a small pair of bellows, against the face of the negative plate; by this means any bubbles of hydrogen are, as it were, brushed off, and the current obtained from a given electromotive force is materially augmented, since the resistance is diminished. Mr. Preece then referred to several old forms of battery in which such an agitating principle is introduced, notably those of Grenet, Chutaux, and Comacho, and he went on to describe a series of experiments he has made with a view to ascertain the cause of the great heating and illuminating effects that could be obtained with the apparatus exhibited. He showed that the effects were due to the mechanical agitation of the liquid on the face of the negative plate; but whether the great production of heat in the battery, and the great lowering of its internal resistance were chemical, thermal, or electrical effects, remains for further investigation. By means of a small battery of four cells, in which the plates were 4 inches by 2 inches, a length of 6 inches of platinum wire, No. 18 (0·05 inches), could be heated to bright redness, and much more powerful effects were obtained by a large battery of ten cells made by Ladd; in this case, about 2 feet of a No. 14 (0·089 inches) wire were heated, and it was shown that, when connected with an 18-inch inductorium, kindly lent by Mr. Spottiswoode, sparks of over 17 inches could be obtained, but this length was reduced to about 8 inches on stopping the current of air. A similar effect was also very marked when the poles were connected with two carbon points, the light given out when the air-current was introduced being remarkably bright and steady.—Mr. Preece then exhibited an ingenious method of showing the vibrations of a telephone plate to an audience, which has been devised by Mr. H. Edmunds. A vibrating plate is employed to break contact as in Reiss's original telephone, and is introduced into the primary circuit of a small induction coil. The induced current is employed to illuminate a rapidly-rotating Gassiot's tube, and, on making and breaking contact by speaking into the resonator, an illuminated star is observed, the number of whose arms varies with the pitch of the note; with a very low note it may resolve itself into a single straight line.—Lord Rayleigh exhibited and explained an arrangement which he has employed with advantage in certain acoustical experiments, in order to secure absolute uniformity in the rate of rotation of an axle. After referring to the mathematical principles involved in such a problem, he explained that the only hope of its solution lay in the employment of a vibratory movement, which by some suitable device must be converted into a motion of rotation. The axle whose motion it is required to maintain uniform is usually driven, at an approximately uniform rate, by means of a small horizontal water-wheel, or, in some cases, the electro-magnetic regulating apparatus presently described is sufficient by itself to supply the necessary power. At equal distances round the axle are arranged four soft iron armatures which successively come in front of the poles of a horse-shoe electro-magnet placed in the circuit of a four-cell Grove's battery. The current is rendered intermittent by the following arrangement. Passing into the body of a tuning-fork vibrating about forty times per second, it leaves by a small platinum stud which is touched at each vibration of the fork; the current then traverses a second small electro-magnet between the prongs, and by this means the vibrations are maintained; passing to the magnet above referred to the current then returns to the battery. The velocity of the axle is such that it performs about one complete revolution for every four vibrations of the fork, and the exact adjustment is effected as follows. If the driving power be just sufficient to produce the desired speed, the armatures will be so attracted by the magnet as to be exactly opposite to it at the middle of its period of magnetisation, and so long as this position is maintained the magnet will not (on the whole) affect it. But if a disturbance occur in the driving power the armature will be displaced from its former position and will be attracted by the magnet until the error is compensated. Besides the armatures this axle also carries, concentric with it, a hollow metallic ring filled with water, and as this possesses a certain momentum in virtue of its rotation, it will act as a drag tending to check the velocity in case it increases, and in the converse manner when a diminution occurs. A blackened disc perforated with rings of holes of various numbers also rotates with the axle and by placing the eye behind the ring of *four* holes and observing a prong of the fork it is easy to ascertain whether the uniformity is maintained, since in that case the prong will appear to remain stationary.

Entomological Society, May 1.—H. W. Bates, F.L.S., F.Z.S., president, in the chair.—Henry John Elwes, F.L.S., F.Z.S., of Cirencester, was elected an ordinary member, and Mr. Peter Cameron, jun., was elected a subscriber. Mr. Dunning drew attention to the fact that the present meeting marked the forty-fifth anniversary of the foundation of the Society.—Mr. Distant exhibited a specimen of the Hemipteron, *Tetroda bilineata*, Walk., as a remarkable instance of immunity from the effects of damp, the same having been kept in a relaxing-pan for more than four months.—Mr. Distant also communicated a paper "Notes on some Hemiptera-Homoptera, with Descriptions of New Species," in which he drew attention to the uncertainty of generic calculations as to geographical distribution, the Homoptera affording a good illustration in the family Cercopida, especially the genus Cercopis. Part 1 of the *Transactions* for 1878 was on the table.

Royal Microscopical Society, May 1.—H. J. Slack, president, in the chair.—Four new Fellows were elected, and Professor Abbe, of Jena, was elected an Honorary Fellow of the Society.—A paper by Mr. Michael, on new British Cheyleti was read by the Secretary. It minutely described the structure and habits of the insect, and was illustrated by drawings. The name proposed by its discoverer was *Cheyletus flabellifer*.—Mr. Chas. Stewart gave a *résumé* of a paper which had been received from Dr. Oscar Schmidt, of New Orleans, in continuation of a former communication on the blood-corpuscles of Amphiuma, frog, and man. The president suggested to the meeting a series of experiments, which he thought might be of value in the interpretation of optical images, by the examination of microscopic drawings of Lissajous curves under various powers. He also brought before the notice of the Fellows a species of fungus which he had found infesting the leaves of the bay, but which did not appear to derive its nutriment from the leaf itself. After some discussion, the fungus was identified by Dr. M. C. Cooke as *Capnodium*, Footii, which was stated to live upon the honey-dew found upon the surface of the leaves of a large number of trees, particularly in the autumn months.

Institution of Civil Engineers, May 7.—Mr. Bateman, president, in the chair.—The paper read was on the construction of steam boilers adapted for very high pressures, by Mr. James Fortescue Flannery.

WELLINGTON, N. Z.

Philosophical Society, December 11, 1877.—Mr. Carruthers, C.E., the vice-president, occupied the chair.—Dr. Buller read a further paper on the ornithology of New Zealand. Among the species treated of were the Kaka parrot, with an interesting account of the Maori mode of trapping it by means of decoy birds; the two species of migratory cuckoo, with observations on their parasitic habits; the black fantail, the occurrence of which as far north as Auckland has been communicated by Mr. Cheesman; the knot (*Tringa canutus*) which has lately been met with in this island; the sandpiper (*Limnocinchis acuminatus*), and many others. Among the latter was the New Zealand godwit, of which the author gave an interesting sketch. This bird spends a portion of the year in Siberia, and visits in the course of its annual migration the islands of the Indian Archipelago, Polynesia, Australia, and New Zealand. In summer it frequents the south coast of the Sea of Ochotsk, and it has likewise been observed in China, Japan, Java, Celebes, Timor, Norfolk Island, and the New Hebrides. They leave New Zealand towards the end of March or beginning of April, and return to us towards the end of November.—On *Nephrodium decompositum* and *N. glabellum* by T. Kirk, F.L.S.—On *Hymenophyllum montanum*, a new species discovered by Mrs. Mason in the mountains between Lake Wakatipu and the West Coast, by T. K. Kirk, F.L.S.—On the relative ages of the Australian, Tasmanian, and New Zealand coalfields, by Dr. Hector, F.R.S. The speaker's remarks were illustrated by diagrams and maps, and by a large collection of fossils which he had obtained during a recent tour in the Australian colonies. After describing the extent and position of the various coalfields at present worked, he stated that from a comparison of the fossils he had arrived at the following results :—*Cretaceous epoch:* Chief New Zealand coal; wanting in Tasmania and Australia, except perhaps in Queensland. *Jurassic epoch:* Mataura series of New Zealand; Cape Paterson coalfields of Victoria; Clarence River coal of New South Wales; and the coalbeds at Hobarton. *Liassic epoch:* Clent Hill beds of New Zealand; wanting in Tasmania and Australia, except Queensland. *Triassic epoch:* Wairoa beds of New Zealand; upper coal formation of New South Wales; and wanting in Tasmania. *Permio-carboniferous:* Maitai series of New Zealand; lower coal formation of New South Wales; Mersey coalfields of Tasmania. This view of the relative ages of those formations had just received remarkable confirmation by a late discovery. Mr. McKay, of the Geological Survey, who has recently been at work in the Canterbury Alps, having found plant beds beneath the spirife beds of Mount Potts that are full of the leaves of glossopteris, a fern very characteristic of the upper and middle coal formation of New South Wales, and with them beds of graphite of considerable commercial value, which represents in an altered form the Newcastle coal seams. Along with these occur remains of saurian reptiles of immense size, of which large collections have been made. In conclusion, it was stated that only a very small portion of the area coloured on the map of New South Wales as coal formation contained valuable coal seams, and that they were not without drawbacks. At Newcastle, where the principal collieries are situated, the seams have to be worked to an increasing depth by shafts, and require pumping. In the southern coalfield the coal is worked by adits into the face of the mountain, and lowered by steep inclines in the same manner as our own Buller coal will be worked; but it has to be shipped from an exposed coast. The western district coal has all to be carried over the Blue Mountains by a railway that ascends and descends by zigzags, that answer well enough for passengers and light traffic, but must be rather costly for transporting coal. Dr. Hector stated that all he had seen increased his confidence in the value of our West Coast coalfields, both as regards the quality and extent of the coal and the facilities for working it.

Paris

Academy of Sciences, May 13.—M. Fizeau in the chair.—The following among other papers were read :—Observation of the transit of Mercury, on May 6, at Montsouris Observatory, by M. Mouchez. The observations were vague, owing to the bad weather, but so far confirmed the theory of Mercury. M. Picard got three photographic images, two of which seemed very good, but there was no trace of the planet. M. Mouchez was struck with the much more rapid succession of the phases in the transit of Mercury than in that of Venus; the times of contact should thus be obtainable with greater accuracy.—Researches on the law of Avogadro and Ampère, by M. Wurtz. Bioxalate of potassium becomes hydrated much in the same way in an atmosphere of hydrated chloral, and in one of moist air or chloroform, containing aqueous vapour with the same tension as the atmosphere of hydrated chloral. M. Wurtz infers that the latter is entirely dissociated.—M. Du Moncel read a paper on the Hughes microphone, from information communicated by Mr. Crookes.—Report on two memoirs of M. Dien, concerning (1) defective notes of instruments played with a bow, (2) resonance of the minor seventh in the grave chords of the piano. By placing small movable nuts on the short prolongations of the strings above the bridge, so as to tune those parts to the unison or octave of certain defective notes known in the violin, M. Dien gets rid of the disagreeable effect of the latter. In the second memoir he shows the resonance in question to be due to pressure of the damper on touching one of the nodes which produces the triple harmonic minor seventh. He employs a second damper acting simultaneously with the other.—On the refraction of organic substances in the gaseous state, by M. Mascart. It appears, generally, that no method based on the sole consideration of elementary composition enables one to calculate the refraction of a compound from those of its constituents. The notion of equivalents of refraction does not apply to gases any more than to solids or liquids. Each case has its special considerations, not easily determined.—On the production of sulphurised oils having insecticide properties, by MM. De La Loyère and Muntz. The considerable amount of combined sulphur found in fetid oils got by distillation of the bituminous limestone of Orbagnoux, the authors augment by introducing sulphate of lime or pyrites into the mineral before distillation.—On the telephone, by M. Izarn. A curious case of intelligible sounds being produced in one single-wire telephone system, by a derivation of current from other systems through wet ground and a system of pipes.—On a new electric lamp with incandescence, acting in free air, by M. Reznier. If a thin rod of carbon, pressed laterally by an elastic contact, and pushed in the direction of its axis, against a fixed contact, be traversed by a pretty strong current, it becomes incandescent at this part and burns, growing thinner towards the end. As the end gets used up, the rod, still pushed, slides in the elastic contact, always pressing against the other. The heat developed by passage of the current is greatly increased by the combustion of the carbon.—On a production of heat by chemical action, by M. Phipson. If a piece of chloride of lime be held in a rapid current of sulphuretted hydrogen from a narrow glass tube, the smell of sulphuretted hydrogen at once disappears, and is replaced by that of chlorine; a very light deposit of sulphur is formed on the piece, which becomes too hot to hold in the fingers. The reactions here are notable.—Action of aqueous vapour on hydrocarbons raised to red temperature, by M. Coquillion. It facilitates their dissociation while producing a fall of temperature, which in blast furnaces is added to that caused by transformation of carbonic acid into carbonic oxide.—On investigation of ozone in atmospheric air, by M. Daremberg. He finds ozonoscopic researches useless. An ozonograph should be used which should expose the paper only during a few minutes.—Observations of the moon, made with meridian instruments of Paris Observatory during 1876, by M. Villarceau.

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